

(Following Paper ID and Roll No. to be filled in your Answer Book)									
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B.Tech.

(SEM. II) EVEN THEORY EXAMINATION 2012-13

PHYSICS*Time : 3 Hours**Total Marks : 100***Note :-** (1) Attempt **all** questions.

(2) Marks of each question are shown against it.

Plank Constant $h = 6.63 \times 10^{-34}$ J.sVelocity of light $c = 3 \times 10^8$ m/sMass of electron $m_e = 9.1 \times 10^{-31}$ kgMass of Proton $m_p = 1.67 \times 10^{-27}$ kgMass of Neutron $m_n = 1.67 \times 10^{-27}$ kg

1. Attempt any **four** parts of the following : (5×4=20)
 - (a) Derive the relativistic relation between energy and momentum.
 - (b) If variation of mass with velocity is taken into consideration, then find the K.E. of a particle of rest mass m_0 and moving with velocity v . If $v \ll c$ show that the relativistic K.E. will convert into classical K.E.
 - (c) What is the object of M.M. experiment ? Explain its negative results.
 - (d) Derive the expression of time dilation. Show that time dilation is a real effect.

- (e) How fast would a rocket have to go relative to an observer for its length to be contracted to 99% of its length at rest.
- (f) Find the mass and speed of an electron having energy 2 MeV.
2. Attempt any **two** parts of the following : **(10×2=20)**
- (a) Describe the interference observed when a thin uniform film is seen normally by reflected light. Find the expression of fringe width. What is the effect on interference pattern when a plane mirror is placed at the lower surface of plane glass plate ?
- (b) Give the construction and theory of Plane transmission grating.
- (c) (i) Calculate the aperture of the objective of telescope which may be used to resolve two stars separated by 2.44×10^{-6} radians for light of wavelength 6000 Å.
- (ii) In Newton's ring experiment, the diameter of 4th and 12th dark rings are 0.400 cm and 0.700 cm respectively. Find the radius of 20th dark ring.
3. Attempt any **two** parts of the following : **(10×2=20)**
- (a) (i) What is meant by optical rotation ? Give the Fresnel theory of optical rotation and discuss its dependence on wavelength.
- (ii) The specific rotation of quartz at 5086 Å is 29.73 deg/mm. Calculate difference in refractive indices.
- (b) Discuss the construction and working of Ruby laser. Why He-Ne Laser is better than Ruby Laser ?

- (c) Discuss the production and detection of plane polarized, circularly polarized and elliptically polarized light.
4. Attempt any **two** parts of the following : **(10×2=20)**
- (a) Define Pointing vector and discuss work energy theorem of electromagnetic field.
- (b) Discuss Langevin's theory of diamagnetism. Show that diamagnetic susceptibility is always negative and independent of temperature.
- (c) (i) Find the skin depth at frequency 71.6 MHz in aluminium. The related parameters for aluminium are $\mu = \mu_0 = 4\pi \times 10^{-7}$ N/amp² and $\sigma = 3.58 \times 10^7$ siemen/m.
- (ii) Derive the relation between three electric vector D, E and P.
5. Attempt any **four** parts of the following : **(5×4=20)**
- (a) What is the physical significance of uncertainty principle ? Apply it to find the expression of first Bohr's orbit.
- (b) Calculate the wavelength associated with a neutron having K.E. 1 eV.
- (c) What is Compton effect ? Derive the expression of Compton shift.
- (d) Derive time dependent Schrodinger equation and also discuss its physical significance.
- (e) The energy of linear harmonic oscillator in its third excited state is 0.1 eV. Calculate the frequency of vibration.
- (f) Differentiate between phase velocity and group velocity. Derive the relation between them.